COCODRIE LAKE TMDL FOR AMMONIA AND NOXIOUS AQUATIC PLANTS

SUBSEGMENT 060102

US EPA Region 6

Final

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TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to establish total maximum daily loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. This TMDL addresses two causes of impairment of Cocodrie Lake that are linked: ammonia and noxious aquatic plants.

Cocodrie Lake, Subsegment 060102, was listed for ammonia and noxious aquatic plants on the October 28, 1999 Court Ordered §303(d) list as not fully supporting the water quality standards for propagation of fish and wildlife, and was ranked as high priority for TMDL development. Cocodrie Lake was listed on the October 28, 1999 Court Ordered §303(d) list for ammonia and noxious aquatic plants by virtue of its listing in the State of Louisiana's 1993 Nonpoint Source (NPS) Report. This subsegment was listed as "impacted by nonpoint source pollution", with ammonia listed as one of the suspected causes of impact (LDEQ 1993). There is presently no criterion available for ammonia in the State's water quality standards. With no ammonia criterion available to establish a TMDL target, an alternative approach was used. On April 29, 1996, LDEQ issued a declaratory ruling, which states: "That DO directly correlates with overall nutrient impact is a well-established biological and ecological principle. Thus, when the LDEQ maintains and protects DO, the LDEQ is in effect also limiting and controlling nutrient concentrations and impacts." DO serves as an indicator for which a water quality criterion exists and is used in the assessment of use support. Therefore, this TMDL sets out the reduction in ammonia loading required to attain the dissolved oxygen standard. The current applicable dissolved oxygen criterion for Cocodrie Lake is 5.0 mg/L year-round.

A load allocation of zero and a wasteload allocation of zero for noxious aquatic plants (native and invasive) are established in this TMDL. Invasive species have an extremely high rate of plant growth, and therefore exotic plant growth needs to be controlled to zero levels to avoid re-introduction and re-growth. Natural and anthropogenic nutrient enrichment contributes to noxious aquatic plant growth in Cocodrie Lake. A reduction of ammonia as total nitrogen input into Cocodrie Lake will reduce noxious aquatic plant growth in the lake. Therefore, in this TMDL, the ammonia as total nitrogen loading required to control excessive plant growth will serve as part of the noxious aquatic plant TMDL. Additional in-lake macrophyte control methods may also be needed beyond ammonia reductions to control plant growth to the level needed to meet the designated use of fish and wildlife propagation.

Consistent with EPA's obligations in Sierra Club, et al. v. Gerald Clifford, et al., 96-0527 (E.D. La.) to establish TMDLs for waters on Louisiana's 303(d) list, and the suspected correlation between reduction of ammonia input into Cocodrie Lake and reduction of noxious aquatic plant growth, EPA is establishing this ammonia and noxious aquatic plant TMDL. EPA interprets Section 303(d) to require that TMDLs must be established where a waterbody is impaired or threatened by a "pollutant." EPA considers the noxious aquatic plant growth in Cocodrie Lake to be a "pollutant" within the meaning of Section 502(6) of the Clean Water Act. Today's action does not represent a determination by the Agency that section 303(d) listings for such impairments as "noxious aquatic plants," "invasive species" or "exotic species" are in all cases "pollutants" within the meaning of Section 502(6) of the Clean Water Act. In 1978, EPA decided that all pollutants, under proper technical conditions, are suitable for the calculation of TMDLs (43 Fed. Reg. 60662, December 28, 1978). EPA may reevaluate whether materials such as "noxious aquatic plants" are pollutants, generally or in individual situations, for Clean Water Act purposes.

There are no direct point sources dischargers to the Cocodrie Lake; however, there are two point source dischargers located on the tributaries flowing into Cocodrie Lake. This ammonia and noxious aquatic plant TMDL includes these two point source dischargers, waste load allocations (WLAs), load allocations (LAs), and margins of safety (MOS). As presented in FTN Associates, Ltd. (2000), the summer season DO standards of 5.0 mg/L can be maintained with a 100% reduction of all manmade nonpoint sources. For the winter season, DO standards of 5.0 mg/L can be maintained with a 0% reduction from all manmade nonpoint sources. We believe that during the summer season, a 100% reduction of all manmade nonpoint sources for ammonia as total nitrogen will reduce noxious aquatic plant growth throughout the year. Additional in-lake macrophyte control methods may be needed beyond ammonia control methods to reduce plant growth and meet water quality standards.

1. Introduction

Cocodrie Lake, subsegment 060102, was listed on the October 28, 1999 Court Ordered §303(d) list as not fully supporting the water quality standard for the propagation of fish and wildlife. A TMDL for ammonia and noxious aquatic plants was developed in accordance with the requirements of Section 303(d) of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. This TMDL includes a wasteload allocation (WLA), a load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the portion of the load capacity allocated to point sources for the pollutant of concern, and the load allocation is the portion of the load capacity allocated to nonpoint sources and/or to natural background. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

2. Study Area Description

Water quality segment 060102 is located in southern Louisiana in the Vermilion-Teche River Basin between Alexandria and Lafayette. The basin is bordered on the north and northeast by a low escarpment and the lower end of the Red River Basin. The Atchafalaya River Basin is to the east, and the Mermentau River Basin is to the west (LDEQ, 1996).

Land use in the Vermilion-Teche Basin is largely forestry and agriculture. In the segment under study, land use is predominantly forestry accounting for 80.3% of the total segment area. Land use in the watershed is summarized in Table 1. See FTN Associates, Ltd. (2000) for additional description and discussion of the study area.

Table 1. Land Uses in WQ Segment 0601 (Upstream of Cocodrie Dam) (LDEQ, 1993).

	% of Total Area
Land Use Type	Segment 0601
Urban	1.4
Extractive	0.0
Agricultural	9.4
Forest Land	80.3
Water	0.2
Wetland	6.2
Barren land	2.5
Other	0.0
TOTAL	100

2.1 Lake Cocodrie, Subsegment 060102

Cocodrie Lake is a shallow lake that is mostly covered with timber. Inflows to Cocodrie Lake include the upper part of Bayou Cocodrie, Spring Creek, Little Spring Creek, and Hurricane Creek. The total drainage area of Cocodrie Lake is approximately 227 square miles (USGS, 1971). The outlet of Cocodrie Lake consists of an uncontrolled overflow spillway across the

channel of Bayou Cocodrie near Highway 167. The lake can be drawn down below the spillway level via a bypass valve and a control.

2.2 Water Quality Standards

The designated uses for Cocodrie Lake include primary contact recreation, secondary contact recreation and propagation of fish and wildlife. Cocodrie Lake was listed on the October 28, 1999 Court Ordered §303(d) list for ammonia by virtue of its listing in the State of Louisiana's 1993 Nonpoint Source (NPS) Report. This subsegment was listed as "impacted by nonpoint source pollution", with ammonia and noxious aquatic plants listed as one of the suspected causes of impact (LDEQ, 1993). There is presently no criterion available for ammonia in the State's water quality standards (LDEQ, 2000). With no ammonia criterion available to establish a TMDL target, an alternative approach was used. On April 29, 1996, LDEQ issued a declaratory ruling which states: "That DO directly correlates with overall nutrient impact is a well-established biological and ecological principle. Thus, when the LDEQ maintains and protects DO, the LDEQ is in effect also limiting and controlling nutrient concentrations and impacts." DO serves as an indicator of whether a water body is meeting the narrative water quality criterion for ammonia and is used in the assessment of use support. Therefore, in this TMDL, the ammonia loading required to maintain the dissolved oxygen standard serves as the ammonia TMDL. The current applicable dissolved oxygen DO standard is 5.0 mg/L year-round.

In addition, the LDEQ Water Quality general standards at §1113.B.1.e provides that all waters be free from such concentrations of substances attributable to wastewater or other discharges sufficient to produce undesirable or nuisance aquatic life. These general and numeric standards are established to promote restoration, maintenance and protection of state waters. Due to typical storage of nutrients in lake sediment, and the very fast rate of growth of native and invasive noxious aquatic plants, reducing nutrient loadings by themselves is not expected to reduce nuisance aquatic plant growth to a level necessary to meet this standard and restore the designated use of fish and wildlife propagation (see discussion in Section 2.3). Therefore, in addition to the nutrient loadings being established, a level of nuisance aquatic plant loading is established to meet this narrative water quality criterion.

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of Cocodrie Lake are designated as "Other" (natural sources) (LDEQ, 1998). Sources identified in the State's 1993 Nonpoint Source §319 Report include irrigated and non-irrigated crop production, aquaculture, and municipal point sources (LDEQ, 1993).

2.3.1 Noxious Aquatic Plants

Direct verbal and written communication with the Louisiana Department of Wildlife and Fisheries (LDWF) indicates that both exotic and native aquatic macrophytes require control in this water body in order to meet the designated use of fish and wildlife propagation (Personal Communication LDWF, November 2000). Table 2 summarizes both native and invasive noxious aquatic plants that LDWF have identified as contributing to impairment of the fish and wildlife propagation water quality standard in Cocodrie Lake. These include submersed, floating and immersed species of plants. Hydrilla (*Hydrilla verticillata*) has been identified as one of the most problematic noxious aquatic species in Cocodrie Lake. Noxious aquatic plant growth in Cocodrie Lake is probably the result of natural and anthropogenic nutrient enrichment. This TMDL is premised on the linkage between ammonia/nitrogen levels and noxious aquatic plant growth in Cocodrie Lake, which is that reductions in ammonia/nitrogen loadings to the lake will lead to reduced plant growth and infestation, and thereby contribute to reaching the goal of attaining the dissolved oxygen standard.

Table 2. Exotic invasive and dominant native aquatic plant species

Exotic invasive species	Dominant native species
hydrilla (*Hydrilla verticillata*)	coontail (*Ceratophyllum demersum*)
milfoil (*Myriophyllum heterophyllum)*	fanwort (*Cabomba caroliniana*)
water hyacinth (*Eichhornia crassipes)*	southern water grass (*Hydrochloa caroliniensis*)
salvinia (*Salvinia minima*)	duckweed (*Lemna minor*)
alligator weed (*Alteranthera philoxeroides)*	watershield (*Brasenia schreberi*)
	American lotus (*Nelumbo lutea*)

Source: LDWF, Personal Communication, 2000.

There is a complex relationship between nutrient loading and macrophyte growth in lakes. In algal or non-rooted macrophyte dominated systems, nutrient reduction in the water column can be expected to show a positive effect, usually resulting in a direct reduction of noxious aquatic plant growth to meet water quality standards. However, for waters where rooted macrophytes dominate, or where fast-growing invasive aquatic species exist, as is the case in Cocodrie Lake, the situation is more complex. In the first case, the rooted macrophytes may derive much of their needed nutrients from nutrient laden sediments. In such cases the response of the rooted macrophytes to water column reductions of nutrients will be slower than that of non-rooted macrophytes that rely on the water column for their nutrients. Consequently, controlling nutrient loadings may not be adequate to reduce noxious aquatic plant growth. Therefore, additional in-lake management measures may be required to achieve reductions in plant biomass to meet water quality standards.

In the second case, where invasive plant species are present, their extremely high rate of growth and reproduction in the waterbody can lead to significant proliferation and water quality impairment, even in the absence or control of nutrient enrichment. In addition, invasive species may also be brought in from other waterbodies, usually by watercraft, and establish new populations of nuisance aquatic species, thereby contributing to non-attainment of the designated uses. LDWF has indicated that noxious aquatic invasive species growth and proliferation, and additional introduction of noxious aquatics probably by boat traffic, is impairing Cocodrie Lake.

It is likely that additional control methods may be needed to reduce noxious aquatic plant growth necessary to meet the water quality standards. These may include plant harvesting, application of herbicides, active drawdown, and other near-lake controls to prevent re-establishment of noxious plant populations from outside sources.

2.3.2 Point Sources

There are no direct point sources dischargers to the Cocodrie Lake; however, there are two point source dischargers located on the tributaries flowing into Cocodrie Lake. There are five permitted facilities with known flow information discharging sanitary wastewater into the Bayou Cocodrie watershed (see Table 3). EPA expects ammonia contribution from the point source dischargers to be controlled through NPDES permit limits for NH_3-N.

2.3.3 Nonpoint Sources

There is insufficient information available to assign nonpoint loads to specific sources in this system. Based on land use in the watershed there is potential for ammonia input through nonpoint source loading (see Table 1).

3. TMDL Load/Wasteload Calculations

LDEQ submitted a DO model for Bayou Cocodrie in December 1999, which was further revised in September 2000 (FTN Associates, Ltd. 2000). EPA reviewed the model and determined that it was appropriate for use in this TMDL. This model was used to calculate the needed ammonia reductions for this subsegment. Tables 4.2 and 4.4 in the DO TMDL modeling report (FTN Associates, Ltd. 2000) included cumulative WLAs, LAs, and MOS for the entire Bayou Cocodrie watershed. Appendix A presents the WLAs, LAs, and MOS for Cocodrie Lake, Subsegment 060102.

3.1 Loading Capacity and TMDL Formulation

3.1.1 Ammonia

According to FTN Associates, Ltd. (2000), input data for the calibration model were developed from the LDEQ Reference Stream Study, data collected during the 1999 intensive survey, data collected by LDEQ and USGS at several ambient monitoring stations in the watershed, DMRs, permits and permit applications for each of the point source dischargers, USGS drainage area and low flow publications, previous modeling studies conducted by LDEQ in the area, and data

Table 3. Point Source Wasteload Allocations

Dischargers to Bayou Cocodrie Watershed Subsegment 060102											
Facility	Permit #	Receiving Water	Discharge Flow MGD	Summer CBOD5/ NH3-N/ Org-N mg/l	Winter CBOD5/ NH3-N/ Org-N mg/l	Summer CBOD5 WLA lbs/day	Summer NH3-N WLA lbs/day	Summer Org-N WLA lbs/day	Winter CBOD5 WLA lbs/day	Winter NH3-N WLA lbs/day	Winter Org-N WLA lbs/day
Village of Forest Hill*	LAG570142	Hurricane Ck, then to Cocodrie Lk	0.074	10/10/20	10/10/20	6.17	6.17	12.34	6.17	6.17	12.34
City of Glenmora*	LA0054925	Little Spring Ck, then to Cocodrie Lk	0.228	10/2/4	10/10/20	19.01	3.80	7.61	19.01	19.01	38.02
		TOTAL				25.18	9.97	19.95	25.18	25.18	50.36
		TOTAL (NH3-N * 4.3=UNBOD)					42.87			108.27	
		TOTAL (Org-N * 4.3=UNBOD)						85.78			216.55
		TOTAL (CBOD5 * 2.3=UCBOD)				57.91			57.91		

* These two discharges are located on tributaries flowing into Cocodrie Lake. The individual discharger WLAs were recalculated based on $CBOD_5$ and NH_3-N concentrations as listed in 2000 summer and winter TMDL calculations for Bayou Cocodrie (FTN, 2000). Tables 3 and 4 present the WLAs, LAs, and MOS for this ammonia TMDL. Note that there is a difference of 3.36 lbs/day of UBOD for summer and 3.33 lbs/day of UBOD for winter, when comparing the UBOD values presented in Tables 3 and 4. This is due to the rounding errors that occurred when calculating the individual WLAs.

garnered from several previous LDEQ studies on non-point source loadings. A satisfactory calibration was achieved for most of the system. In those cases where the calibration was not as accurate (primarily due to extremely limited data), the difference was in the conservative direction. For the projection models, data were taken from the current municipal discharge permits, current applications and ambient temperature records.

Modeling was limited to low flow scenarios for both the calibration and the projections since the constituent of concern was dissolved oxygen and the available data was limited to low flow conditions. The model used was QUAL-TX, a modified version of the QUAL-II water quality modeling system. QUAL-TX was selected since it offers the ability to model branched systems and has been used successfully in Louisiana in the past. See FTN Associates, Ltd. (1999) for additional discussion of the modeling system used.

3.1.2 Noxious Aquatic Plants

The loading capacity for noxious aquatic plants is zero. Invasive species have an extremely high rate of plant growth, therefore exotic noxious aquatic plant biomass should be controlled to zero levels to avoid reintroduction and regrowth.

3.2 Load Allocations

3.2.1 Ammonia

Seasonal load allocations are presented in Table 4. See FTN Associates, Ltd. (2000) for a detailed discussion of load allocation. The load allocation in Table 4 is calculated using the sum of natural nonpoint source LAs and manmade nonpoint source LAs (See Appendix A, "Notes for TMDL calculations for Bayou Cocodrie Subsegment 060102" provided to EPA by FTN Associates, Ltd., December 18, 2000).

As presented in FTN Associates, Ltd. (2000), the summer season DO standards of 5.0 mg/L can be maintained with a 100% reduction of ammonia from all manmade nonpoint sources. For the winter season, DO standards of 5.0 mg/L can be maintained with a 0% reduction from all manmade nonpoint sources.

Table 4 Total Maximum Daily Loads

ALLOCATION	SUMMER (June – August) lbs/day UBOD=UCBOD+UNBOD	WINTER (September – May) lbs/day UBOD=UCBOD+UNBOD
Point Source WLA	183.2	379.4
Margin of Safety	3300	4928.8
Load Allocation	136801.6	116581.5
TMDL	140284.8	121889.7

3.2.2 Noxious Aquatic Plants

A load allocation for exotic, noxious aquatic plants of zero pounds of plant biomass is established in this TMDL. Because of the extremely high rate of invasive species plant growth, exotic noxious aquatic plants need to be controlled to zero levels to avoid reintroduction and regrowth.

3.3 Wasteload Allocations

3.3.1 Ammonia

Seasonal wasteload allocations for individual point source dischargers are presented in Table 3. The total cumulative WLAs for summer and winter are presented in Table 4.

3.3.2 Noxious Aquatic Plants

The wasteload allocation for noxious aquatic plants is zero. No point sources of noxious aquatic plants are known to exist.

3.4 Seasonal Variation

Critical conditions for dissolved oxygen in Louisiana have been determined to be when there is negligible nonpoint run-off and low stream flow combined with high stream temperature. In addition, the models account for loadings that occur at higher flows by modeling sediment oxygen demand. Oxygen demanding pollutants that enter the stream during higher flows settle to the bottom and then exert the greatest oxygen demand during the high temperature seasons. Additionally, this TMDL looked at the winter and summer seasons by varying temperature.

3.5 Margin of Safety

The margin of safety (MOS) presented in Table 4 was calculated as the sum of point source reserve MOS and manmade nonpoint source reserve MOS (See Appendix A, "Notes for TMDL calculations for Bayou Cocodrie Subsegment 060102" provided to EPA by FTN Associates, Ltd., December 18, 2000). The MOS accounts for any lack of knowledge or uncertainty concerning the relationship between load allocations and water quality. According to FTN Associates, Ltd. (2000), the highest temperatures occur in July-August, the lowest stream flows occur in October-November, and the maximum point source discharge occurs following a significant rainfall, i.e. high-flow conditions. The combination of these conditions, in addition to other conservative assumptions regarding rates and loadings, yields an implied MOS that has not been quantified. Over and above this implicit MOS, LDEQ regularly uses an explicit MOS of 20% for point and up to 10% for nonpoint loads, as was done in this TMDL (See Appendix A).

4. Reasonable Assurance and Other Relevant Information

An implementation plan is not an approvable element of the TMDL, but nevertheless, EPA guidance provides that there should be reasonable assurance that the reductions established in the TMDL can be reached so as to meet water quality standards.

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for permitting, enforcement and monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 – Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

The LDEQ also receives federal funding under the Clean Water Act Section 319(h) Nonpoint Source program. The Louisiana Nonpoint Source Management Plan identifies that the LDEQ will continue to work cooperatively with the federal, state and local partners that assist them in the implementation of statewide educational programs and watershed protection and restoration projects to restore the designated uses of waterbodies. The Management Plan also identifies the State's goal to address nonpoint sources of pollution in the Mermentau/Vermilion basin by the end of 2007. It is anticipated that the state will evaluate if actions have been successful in restoring designated uses in the Mermentau/Vermilion by the end of 2008.

In addition, as described above in Section 2, reduction of nutrient loadings may not be entirely adequate to control plant growth necessary to meet the water quality standards. Additional management methods may include plant harvesting, application of herbicides, active drawdown, and other near-lake controls to prevent re-establishment of noxious plant populations from outside sources. The LDWF has established a statewide program to manage problem aquatic vegetation. The Louisiana management philosophy is based on the belief that eradication of these problem species on a large scale is not feasible. The management philosophy and goal of the aquatic plant program for Louisiana is maintenance control. This is defined as "the strategy of keeping nuisance aquatic plants at their lowest feasible levels by a constant program of search and destroy of infestations." A number of alternatives have been explored in an effort to develop the most efficient, safe, and economical program for controlling nuisance aquatic plants in Louisiana. Consistent with the need to safeguard the environment, combinations of herbicide control (utilizing EPA approved herbicides), water level fluctuations and approved biological agents are the most efficient, economical and practical measures presently available for the aquatic plant management and control in Louisiana. (LDWF, Personal Communication, 2000). Herbicide application has been used for the past three or four years to control hydrilla.

Finally, as part of the State of Louisiana's strategy to control the growth and spread of invasive aquatic plants, the LDWF has the following regulation concerning noxious aquatic plants in their recreational fishery regulations:

Noxious Aquatic Plants – Importation Prohibited

No person shall, at any time, knowingly import or cause to be transported into the jurisdiction of the state of Louisiana from any other state or country, without first obtaining a written permit from the Commission, any of the following noxious aquatic plants which are or can be grown submerged or partly submerged, or floating in water. Eichhornia azurea (rooting or anchoring hyacinth), Elodea Canadensis (elodea), Hydrilla spp. (hydrilla), Lagarosiphon muscoides & Lagarosiphon major (African elodea), Myriophyllum spicatum (Eurasian watermilfoil), Najas marina (marine naiad), Najas minor (slender naiad), Panicum repens (torpedograss), Pontederia spp. (pickerelweed), Spirodela oligorrhiza (giant duckweed), Trapa (waterchestnut), Melaleuca quinquenvia (kapok tree), Pistia stratioties (water lettuce), Salvinia spp. (salvinia), Lythrum salicaria (purple loosestrife), Eichhornia crassipes (water hyacinth).

This ban on the importation of noxious aquatic species from other states or countries to fresh waters of Louisiana should help to control the growth and proliferation of noxious aquatic plants in Cocodrie Lake in order to meet the zero loading specified in the TMDL.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

FTN Associates, Ltd. 1999. Bayou Cocodrie Watershed TMDL For Dissolved Oxygen Including WLAs For Five Point Source Discharges, Subsegments 060101, 060102, 060201, 060202, and 060203, Surveyed September 1999. Little Rock, AR.

FTN Associates, Ltd. 2000. Bayou Cocodrie Watershed TMDL Report For Dissolved Oxygen Including WLAs For Five Point Source Discharges, Subsegments 060101, 060102, 060201, 060202, and 060203, Surveyed September 1999 (Revised). Little Rock, AR.

LDEQ. 1987. *State of Louisiana Water Quality Management Plan, Volume 4: Boundaries and Inventories***.** Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge.

_____. 1993. *State of Louisiana Water Quality Management Plan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge.

_____. 1996. State of Louisiana Declaratory Ruling, April 30, 1996. Proceedings Under the Environmental Quality Act, La.R.S. 30:2001, et seq. Docket No. AHD-DR-96001. Sierra Club and Louisiana Environmental Network Request for Nutrient Limits.

_____. 1996. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge.

_____. 1998. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory.* Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge.

_____. 2000. *Environmental Regulatory Code, Part IX. Water Quality Regulations.* Louisiana Department of Environmental Quality.

_____. 2000. Louisiana's Nonpoint Source Management Plan. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge.

Louisiana Department of Wildlife and Fisheries (LDWF). 2000. Personal Communication. Scott Longman, November, 2000.

APPENDIX A

Notes for TMDL Calculations for Bayou Cocodrie Subsegment 060102
Source: FTN Associates Ltd. (provided to EPA 12/18/00)

INTERMED. CALCS (summer)	Oxygen demand (lb/day) from:				pg 1 of 1
	CBODu	NH3-N	Org N	SOD	
Manmade NPS loads:					
NPS loads not assoc. w/ flow	32438.2	0.0	0.0	0.0	
Headwater and trib NPS loads	0.0	0.0	75.5	n.a.	
Total Manmade NPS loads	32438.2	0.0	75.5	0.0	
Natural NPS loads:					
NPS loads not assoc. w/ flow	14753.6	1995.7	476.0	69949.5	
Headwater and trib NPS loads	430.7	19848.4	85.3	n.a.	
Total Natural NPS loads	15184.3	21844.1	561.3	69949.5	

TMDL FOR SUMMER FOR COCODRIE LAKE SUBSEGMENT 060102
(including Little Spring Creek, Hurricane Creek, and Cocodrie Lake)

	Oxygen demand (lb/day) from:				Total oxygen demand
	CBODu	NH3-N	Org N	SOD	(lb/day)
WLA for point sources	57.1	42.0	84.1	n.a.	183.2
MOS for point sources	14.9	11.2	22.4	n.a.	48.5
LA for manmade nonpoint sources	29194.4	0.0	68.0	0.0	29262.4
MOS for manmade nonpoint sources	3243.8	0.0	7.6	0.0	3251.4
LA for natural nonpoint sources	15184.3	21844.1	561.3	69949.5	107539.2
MOS for natural nonpoint sources	0.0	0.0	0.0	0.0	0.0
Total maximum daily load	47694.4	21897.4	743.3	69949.5	140284.6

APPENDIX A (continued)

Notes for TMDL Calculations for Bayou Cocodrie Subsegment 060102

INTERMED. CALCS (winter)	Oxygen demand (lb/day) from:				pg 1 of 1
	CBODu	NH3-N	Org N	SOD	
Manmade NPS loads:					
NPS loads not assoc. w/ flow	48030.0	0.0	0.0	169.2	
Headwater and trib NPS loads	0.0	0.0	98.9	n.a.	
Total Manmade NPS loads	48030.0	0.0	98.9	169.2	
Natural NPS loads:					
NPS loads not assoc. w/ flow	14696.0	1997.0	476.5	29195.4	
Headwater and trib NPS loads	585.6	26025.8	136.9	n.a.	
Total Natural NPS loads	15281.6	28022.9	613.3	29195.4	

TMDL FOR WINTER FOR COCODRIE LAKE SUBSEGMENT 060102
(including Little Spring Creek, Hurricane Creek, and Cocodrie Lake)

	Oxygen demand (lb/day) from:				Total oxygen demand (lb/day)
	CBODu	NH3-N	Org N	SOD	
WLA for point sources	57.1	107.4	214.9	n.a.	379.4
MOS for point sources	14.9	28.0	56.1	n.a.	99.0
LA for manmade nonpoint sources	43227.0	0.0	89.0	152.3	43468.3
MOS for manmade nonpoint sources	4803.0	0.0	9.9	16.9	4829.8
LA for natural nonpoint sources	15281.6	28022.9	613.3	29195.4	73113.2
MOS for natural nonpoint sources	0.0	0.0	0.0	0.0	0.0
Total maximum daily load	63383.5	28158.3	983.2	29364.6	121889.7